DP Barcode : D217446
PC Code No : 128501
EEB Out : / /

To: Robert Taylor
Product Manager 25
Registration Division (7505C)

From: Anthony F. Maciorowski, Chief
Ecological Effects Branch/EFED (7507C)

Attached, please find the EEB review of...

Reg./File # : 010182-00324
Chemical Name : Sulfosate
Type Product : herbicide
Product Name : Touchdown
Company Name : Zeneca
Purpose : Review amendment for pome fruit and wheat.

Action Code: 330 Date Due: 11/16/95
Reviewer: Joanne Edwards

EEB Guideline/MRID Summary Table: The review in this package contains an evaluation of the following:

GDLN NO	MRID NO	CAT	GDLN NO	MRID NO	CAT	GDLN NO	MRID NO	CAT
71-1(A)			72-2(A)			72-7(A)		
71-1(B)			72-2(B)			72-7(B)		
71-2(A)			72-3(A)			122-1(A)		
71-2(B)			72-3(B)			122-1(B)		
71-3			72-3(C)			122-2		
71-4(A)			72-3(D)			123-1(A) ?		
71-4(B)			72-3(E)			123-1(B) ?		
71-5(A)			72-3(F)			123-2		
71-5(B)			72-4(A)			124-1		
72-1(A)			72-4(B)			124-2		
72-1(B)			72-5			141-1		
72-1(C)			72-6			141-2		
72-1(D)						141-5		

Y=Acceptable (Study satisfied Guideline)/Concur
P=Partial (Study partially fulfilled Guideline but additional information is needed
S=Supplemental (Study provided useful information but Guideline was not satisfied)
N=Unacceptable (Study was rejected)/Nonconcur

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

MEMORANDUM

Subject: Request to Register New Crops (Wheat and Pome Fruits - Apples, Crabapples, Loquat, Pear and Quince) For Sulfosate (D217446, D217455, D217461))

From: Anthony F. Maciorowski, Chief for H.T. Craven 11/8/95
Ecological Effects Branch
Environmental Fate and Effects Division (7507C)

To: Robert Taylor, Product Manager 25
Registration Division (7505C)

Zeneca Ag Products is requesting to add wheat and pome fruits to their registered Touchdown Herbicide label, EPA Reg. No. 10182-324, containing the active ingredient sulfosate. No increase in the registered maximum annual use rate (4 lb ai/A) is proposed for pome fruit. For wheat, the maximum annual use rate is increased to 5 lb ai/A (4 lb ai/A per year as a combination of broadcast sprays prior to crop emergence and as a spot spray, and 1 lb ai/A per year as pre-harvest application). A copy of the review for this amended application is attached. For the reason given below, EEB recommends against allowing an expansion of uses for sulfosate at this time.

Even though LOCs[1/] were not exceeded, the EEB is concerned that the use of this product in the manner prescribed on the labeling may result in possible adverse effects to aquatic organisms. Touchdown Herbicide requires the addition of a surfactant. EEB has information suggesting that sulfosate in combination with a surfactant may result in greatly increased toxicity to aquatic organisms. [Reference: 1/21/87 review for SC-0224LC, an unregistered product containing a sulfosate + surfactant combination; aquatic fish testing showed formulation to be up to 714X as toxic as the technical, exceeding special

[1/] acute, restricted-use and endangered species LOCs for avian and aquatic organisms; chronic risk LOCs for fish and aquatic invertebrates; and acute risk to terrestrial and semi-aquatic plants

review and restricted-use triggers.] In the absence of ecotoxicity testing on sulfosate in combination with the specific surfactants used with this product demonstrating low toxicity, the EEB cannot make a finding of minimal risk for these uses. To better understand the role that surfactants play in the toxicity of Touchdown Herbicide, the following preliminary information is requested:

- o the name of the surfactant that was contained in the unregistered SC-0224LC product, and whether or not its use is currently recommended for application with this product.
- o a list of the recommended surfactants.
- o any available ecotoxicity data utilizing surfactant + sulfosate.
- o the supplemental labeling referenced on page 14 of the label.

Assessments for chronic risk to birds and acute risk to aquatic plants were not performed since data are lacking. Avian reproduction testing is required because multiple applications are allowed. Aquatic plant testing is required for five species. Only one species, Selenastrum capricornatum, was tested. It is recommended that Zeneca, Inc. be requested to provide a timeframe for conducting and submitting these studies to the Agency.

See Section 101.5 for labeling issues.

If you have any questions concerning this memo, contact Joanne Edwards at (703) 305-6736.

Ecological Effect Branch Review

Chemical: Sulfosate (glyphosate-trimesium)

100.0 Submission Purpose and Label Information:

100.1 Submission Purpose and Pesticide Use:

Zeneca Ag Products is requesting to amend the registration of their TOUCHDOWN 6 Herbicide product (EPA Reg. No. 10182-324) to add pome fruit (apple, pear, loquat, crabapple and quince) and wheat. There is no increase in maximum seasonal rate of application (4 lb ai/A) for pome fruit. For wheat, the directions for use allow a maximum of 4 lb ai/A per year as a combination of broadcast sprays prior to crop emergence and as spot spray applications, and 1 lb ai/A per year as pre-harvest application. Recent EEB reviews of amendments to add new uses for sulfosate include R. Hitch's review dated May 26, 1994 to add nuts and stone fruits, and D. Urban's review dated July 6, 1995 to add corn, soybeans and citrus.

100.2 Formulation Data:

EPA Reg. No. 10182-324

Active Ingredient:
Trimethylsulfonium carboxymethylaminomethylphosphonate 57.6%
Inert Ingredients:
Inerts 42.4%

* contains 6 pounds ai/gallon

100.3 Application Methods, Directions, and Rates

Effective control requires a 6-hour rain-free period after application. Application should be to actively growing emerged weeds when they are small (some exceptions apply). Where weeds are difficult to control tank-mixes may be made (e.g. 2-4-D, Banvel, Atrazine, Bladex, Hoelon and others). A surfactant or wetting agent approved for use on growing crops is required with this product. It should contain at least 50% a.i. Dry ammonium sulfate 2% by weight may be used in addition to nonionic surfactant (except in CA and not in wheat or bearing tree fruit) to improve control of weeds in chemical fallow-ecofallow systems, noncrop areas and nonbearing crops.

Applications may be made broadcast, spot application (up to 5% solution to actively growing foliage to uniform wetness, but not to point of run-off), or wiper application (except wheat) for suppression of weeds which have become taller than the crop or

desired vegetation.

For chemical fallow-ecofallow systems, farmstead (noncrop), bearing tree fruit orchards and nonbearing crops do not apply more than 5 1/3 pints per acre per year. For wheat, do not apply more than 4 lb ai/A per year as a combination of broadcast sprays prior to crop emergence and as spot spray applications, and do not apply more than 1 lb ai/A per year as pre-harvest application to wheat.

100.4 Target Organisms

Sulfosate is a nonselective foliar systemic herbicide used to control a broad spectrum of emerged weeds, including most grass and broadleaf weeds.

100.5 Precautionary Labeling:

Environmental precautionary labeling falls under different headings on the label:

ENVIRONMENTAL HAZARDS: Keep out of lakes, ponds and streams. Do not apply directly to water or to areas where surface water is present or to intertidal areas below the mean high water mark. Do not contaminate water by disposal of equipment washwaters or rinsate.

DIRECTIONS FOR USE- Do not apply by aircraft. Do not apply this product through any type of irrigation system.

GENERAL USE PRECAUTIONS- Do not spray if conditions of thermal inversion exist, or if wind direction and speed may cause spray to drift onto adjacent areas. Drift minimization is the responsibility of the applicator. Consult with local and State agricultural authorities for information regarding avoiding or minimizing spray drift.

OTHER PRECAUTIONS- Caution must be taken when applying TOUCHDOWN nonselective foliar systemic herbicide to avoid drift or contact with nontarget plant species. Such contact may result in plant injury.

101 Hazard Assessment

Environmental Fate Information

Extracted from EFGWB review dated October 17, 1994:

"Sulfosate is comprised of two moities: trimethylsulfonium cation (TMS) and caroxymethlaminomethylphoshate anion (CAP). In general, the available field data indicate sulfosate (TMS, CAP

and the AMPA metabolite formed from CAP) adsorbs fairly strongly to soil and would not be expected to move vertically below the 6 inch soil layer.

The data indicate that although there is some photochemical decomposition, chemical decomposition in general is not a significant pathway of degradation of sulfosate. However, sulfosate (CAP moiety) appears to be readily degraded by soil microbes (t1/2= 48 to 72 hrs) to aminomethyl phosphonic acid (AMPA), which is degraded further to CO_2, although at a slower rate than the parent sulfosate. In addition, the TMS moiety appears to biodegrade fairly rapidly (t1/2= 72 hrs.) to CO_2 as well.

Even though sulfosate is highly water soluble it appears that parent sulfosate (TMS, CAP) and the AMPA degradate have a low potential to move to ground water due to fairly fast microbial degradation and the adsorptive characteristics as demonstrated in the laboratory and field studies. Laboratory batch equilibrium studies of parent sulfosate in four separate soils indicated a moderate adsorption giving Freundlich K (ads) values of 9-21, desorption values were 4-9. In a soil column (aged 3 day) residues applied to 2 separate soils did not move below 6 cm. Parent sulfosate also showed low mobility in a supplemental soil TLC study. However, sulfosate does have a limited potential to contaminate surface waters. If a runoff event were to occur shortly after application, parent sulfosate would readily wash from the application area and could be transported to local surface waters. In surface water, sulfosate may either photodegrade or persist for some time, depending on light sensitization and water pH.

Based on the low vapor pressure of sulfosate, volatilization from soils will not be an important dissipation mechanism. The low octanol/water coefficient suggest sulfosate will have a low tendency to accumulate in fish."

Ecological Effects Information

Terrestrial Organisms

The Tables below show the results of acceptable acute and subacute toxicity tests which establish the toxicity of sulfosate to birds.

Table 1: Avian Acute Toxicity Findings (LD_{50})

Species	% A.I.	LD_{50} (mg/kg)[1]	MRID No. Author/Year	Toxicity Category	Fulfills Guideline Requirement?
Mallard Duck	20%	950	132568 D. W. Fletcher (1982)	slightly toxic	Yes

[1] SC-0224; corrected to 100% purity.

Table 2: Avian Subacute Dietary Toxicity Findings (LC_{50})

Species	% A.I.	LC_{50} (ppm)[1]	MRID No. Author/Year	Toxicity Category	Fulfills Guideline Requirement?
Northern Bobwhite Quail	20%	>5000	132188 D.W. Fletcher (1982)	practically non-toxic	Yes
Mallard Duck	20%	>5000	132189 D.W. Fletcher (1982)	practically non-toxic	Yes

[1] SC-0224; corrected to 100% purity.

These results indicate that technical sulfosate is slightly to practically non-toxic to avian species on an acute oral and subacute dietary basis. The guideline requirements (Gdlns 71-1 and 71-2) are fulfilled.

Avian reproduction studies (Gdln 71-4) are required when birds may be exposed repeatedly or continuously through persistence, bioaccumulation, or multiple applications, or if mammalian reproduction tests indicate reproductive hazard. Chronic testing is required for this chemical since multiple applications are allowed, e.g. see label directions for use under chemical fallow-ecofallow systems (pg 14) and bearing tree fruit orchards and non-bearing crops (pg 22).

Mammals

Wild mammal testing is unavailable. Surrogate data from a rat acute oral LD_{50} obtained from the Health Effects Division (HED) Tox Oneliners is reported in the Table below.

Table 3: Mammalian Acute Oral Toxicity Findings (LD_{50})

Species	% A.I.	LD_{50} (mg/kg)[2]	MRID No.	Toxicity Category	Fulfills Guideline Requirement?
Rat	62% (technical)	825	249802	slightly toxic	Yes
Rat	39.9[1]	1511	40893802	slightly toxic	Yes

[1] SC-0224 4-LCE formulated product containing 39.9% sulfosate.

[2] LD_{50} is based on geometric mean of male and female LD_{50} values.

The available mammalian data indicate that technical sulfosate and the SC-0024 4LCE formulation is practically non-toxic to small mammals on an acute oral basis.

Insects

The Table below shows the results of a honey bee acute contact LD_{50} study using an unregistered formulated product.

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Table 4: Honey Bee Acute Toxicity Findings

Guideline/ Species	% a.i.	LD_{50} (ug/bee)	MRID No. Author/ Year	Toxicity Category	Fulfills Guideline Require-ment?
Honey bee	40% SC-0224 4LC[1]	>62	250545 E.L. Atkins (1982)	practically non-toxic	practically non-toxic

[1] Company did not pursue registration of this product due to the extreme aquatic toxicity exhibited by the formulation.

The results indicate that sulfosate is practically non-toxic to bees on an acute contact basis. Although testing was conducted on an unregistered formulation, the study does not have to be repeated. An assumption has been made that the registered SC-0024 4LCE formulation is not only less toxic the unregistered SC-0024 4LC formulation (see pg. 8), but both end-use products are close to the % ai of the technuical. The guideline requirement (Gdln 141-1) is fulfilled.

Toxicity to Aquatic Animals

The Table below shows the results of TGAI and formulated product tests conducted to establish toxicity to freshwater fish.

Table 5: Freshwater Fish Acute Toxicity Findings

Species	% A.I.	LC_{50} (ppm)	MRID No. Author/Year	Toxicity Category	Fulfills Guideline Requirement?
Rainbow trout	58.5% (technical)	1800	132185 J.V. Sousa	practically non-toxic	Yes
Rainbow trout	40.8% (SC-0224 4LC)[1]	5.7	250545 Biospherics, Inc (1982)	moderately toxic	Yes
Rainbow trout	39.9% (SC-0224 4LC-E)	320	40893805 J.H. Bowman (1987)	practically non-toxic	Yes
Bluegill sunfish	58.5% (technical)	3500	132184 J.V. Sousa	practically non-toxic	Yes
Bluegill sunfish	40.8% (SC-0224 4-LC)[1]	4.9	250545 Biospherics, Inc. (1982)	moderately toxic	Yes
Bluegill sunfish	39.9% (SC-0024 4LC-E)	297	40893806 J.H. Bowman (1987)	practically non-toxic	Yes

1 Company did not pursue registration of this formulation due to extreme toxicity exhibited by the formulation. See reviews dated 1/21/87 and 3/30/87.

The results of the 96-hour acute toxicity studies indicate that technical sulfosate and the registered formulated product SC-0024 4LC-E is practically non-toxic to fish on an acute basis. The guideline requirement (72-1) is fulfilled.

The Table below shows the results of the fish early life stage test using the TGAI.

Table 6: Fish Early Life-Stage Toxicity Findings

Species	% A.I.	NOEC (ppm)	LOEC (ppm)	MATC (ppm)	MRID No. Author/Year	Endpoints Affected	Fulfills Guideline Requirement?
Rainbow trout	57.3% SC-0224 technical)	51	101	72	40893704, 41111403 P. Cohle (1988)	reduction in growth (length and weight)	Yes

The guideline requirement (Gdln 72-4) is fulfilled.

Freshwater Invertebrates

The Table below shows the results of TGAI and formulated product tests conducted to assess toxicity to freshwater invertebrates.

Table 7: Freshwater Invertebrate Toxicity Findings

Species	% A.I.	EC_{50} (ppm)	MRID No. Author/Year	Toxicity Category	Fulfills Guideline Requirement?
Daphnia magna	58.5% (SC-0224 technical)	71	250545 Biospherics, Inc. (1982)	practically non-toxic	Yes
Daphnia magna	40.8%[1] (SC-0224 4-LC)	1.6	250545 Biospherics, Inc. (1982)	moderately toxic	Yes

1 Company did not pursue registration of this formulation due to extreme toxicity exhibited by the formulation. See reviews dated 1/21/87 and 3/30/87.

The results indicate that technical sulfosate is practically non-toxic to aquatic invertebrates on an acute basis. The guideline requirement (Gdln 72-2) is fulfilled.

The Table below shoes the results of the aquatic invertebrate life-cycle test using the TGAI.

Table 8: Aquatic Invertebrate Life-Cycle Toxicity Findings

Species	% A.I.	NOEC (ppm)	LOEC (ppm)	MATC (ppm)	MRID No. Author/Year	Endpoints Affected	Fulfills Guideline Requirement?
Daphnia magna	57.3% (sc-0224 technical)	1.2	2.1	1.6	40893705, 41111401 A.D. Forbis (1987)	reductions in length and young produced/adult/ reproduction day	Yes

The guideline requirement (Gdln 72-4) is fulfilled.

Estuarine and Marine Animals

The Table below shows the results of estuarine/marine testing using the TGAI.

Table 9: Estuarine/Marine Acute Toxicity Findings

Species	% A.I.	LC_{50} (ppm)	MRID No. Author/Year	Toxicity Category	Fulfills Guideline Requirement?
Eastern oyster embryo larvae	58.3%	115	42977602 Sankey et al (1993)	practically non-toxic	Yes
Mysid Shrimp	56.5%	29	43003301 Kent et al (1993)	slightly toxic	Yes
Sheepshead minnow	58.5%	>320	42977601 Sankey et al (1993)	practically non-toxic	Yes

The results indicate that technical sulfosate is practically non-toxic to slightly toxic on an acute basis. The guideline requirement (Gdln 72-3) is fulfilled.

Toxicity to Plants

Terrestrial

Currently, terrestrial plant testing (seedling emergence and vegetative vigor) is required for herbicides which have terrestrial non-residential outdoor use patterns and which appear to move off site of application through volatilization (vapor pressure $\geq 1.0 \times 10^{-5}$ mm Hg at 25°C) or drift (aerial or irrigation); and/or which may have endangered or threatened plant species associated with the site of application. Although this herbicide does not appear to be volatile (vapor pressure ≤ 4.00 10^{-7} torr at approx. 25°C), there may be endangered or threatened plant species associated with the sites of application.

Data on the toxicity of sulfosate to non-target terrestrial and semi-aquatic plant species (Tier II) is provided in the Table below. Testing was performed using the 4LCE formulation.

Table 10: Terrestrial and Semi-aquatic Plant Toxicity Findings

Species	% A.I.	EC_{25} (lb ai/A) Parameter Affected	NOEC or EC_{05} (lb ai/A) Parameter Affected	MRID No. Author/ Year	Fulfills Guideline Requirement?
Seed Germination and Seedling Emergence					
ten species tested, including oats, corn and soybeans	41.4%	>4 (no effects noted at the highest dose tested)	>4 (no effects noted at the highest dose tested)	Shaw et. al. (1989) 41111403	Yes
Vegetative Vigor					
ten species tested, including oats, corn and soybeans	41.4%	EC_{25} values ranged from 0.053 - 0.25 Brassica napus was most sensitive	0.018 Brassica napus was most sensitive	Shaw et. al. (1989) 41111403	Yes

The guideline requirement (123-1) is fulfilled.

A previous EEB review (Hitch, 5/26/94) referenced a 4 day Tier II algae study with Selenastrum capricornatum showing an EC_{50} of 21.6 ppm (MRID 41111404). The DER for this study cannot be located.

Ecological Exposure and Risk Characterization

Nontarget Terrestrial Animals

Birds

Estimated environmental concentrations (EECs) were calculated based on the work of Hoerger and Kenaga (1972) as modified by Fletcher et. al. 1994. At a maximum annual application rate of 5 lb ai/A, EECs are expected to reach a predicted maximum residue level of 1200 ppm on the foliar surfaces of shortgrass plants. An avian acute risk quotient cannot be calculated because toxicity test effect levels (e.g. LC_{50}s) are unknown. Agency guidelines for subacute dietary testing specify that a study may demonstrate the LC_{50} is >5000 ppm in lieu of demonstrating an actual LC_{50}, and this was the case for sulfosate. Since both bobwhite and mallard exhibited no signs of toxicity at the maximum 5000 ppm level, it is assumed that the regulatory levels of concern for acute effects (High risk, 0.5, restricted-use, 0.2, and endangered species, 0.1) will not be

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exceeded. Risk to non-target avian species is expected to be negligible.

Mmmalian Species

Extrapolating from avian to mammalian species (since avian and rat LD_{50} values are similar), risk to non-target mammalian species is presumed to to be negligible.

Insects

A risk assessment is not performed for nontarget insect species. EEB uses the results of acceptable nontarget insect testing to recommend appropriate label precautions. Based upon the results of the SC-0224 4LC bee study (LD_{50} >62 µg a.i./bee) no label precautions are needed. [An assumption has been made here, based on aquatic testing results, that the SC-0024 4LCE formulation is less toxic than the SC-0024 4LC.]

Nontarget Aquatic Organisms

The GENEEC computer program has recently replaced the back-of-the-envelope method for deriving aquatic exposure estimates. The program is a coarse screen which uses the chemical's chemical and environmental fate characteristics to estimate runoff from a ten hectare field into a one hectare by two meter deep pond. The model calculates both acute and chronic GENEEC values. It considers reduction in dissolved pesticide concentration due to adsorption in soil before washoff to a water body, direct deposition of spray drift into the water body, and degradation of the pesticide within the water body. For the "worst-case" application scenario the resulting values were 0.02 ppm (peak), 0.009 ppm (average 21 days), and 0.005 ppm (average 56 day).

The acute risk to non-target freshwater aquatic organisms is expected to be negligible since the risk quotient derived by dividing the EEC (0.02 ppm) by the toxicity value (LC_{50}) for the most sensitive aquatic organism species tested, the bluegill sunfish (LC_{50} = 297 ppm), does not exceed any of the regulatory levels of concern (High risk, 0.5, restricted-use, 0.1, and endangered species, 0.05).

The acute risk to non-target estuarine/marine aquatic organisms is expected to be negligible since the risk quotient derived by dividing the EEC (0.02 ppm) by the toxicity value (LC_{50}) for the most sensitive estuarine/marine organism species tested, the mysid shrimp (LC_{50} = 29 ppm), does not exceed any of the Agency's regulatory levels of concern (High risk, 0.5, restricted-use, 0.1, and endangered species, 0.05).

The chronic risk to non-target fish species is expected to be negligible since the risk quotient derived by dividing the average 56 day EEC (0.005 ppm) by the MATC for the sheepshead minnow, 72 ppm, does not exceed the regulatory level of concern for chronic risk, 1.

The chronic risk to non-target invertebrate species is expected to be negligible since the risk quotient derived by dividing the average 21 day EEC (0.009 ppm) by the MATC for the daphnid, 1.6 ppm, does not exceed the regulatory level of concern for chronic risk, 1.

Terrestrial and Semi-aquatic Plants

Terrestrial and semi-aquatic plants are exposed to pesticides from runoff, drift or volatilization. Runoff exposure for terrestrial plants is determined from a simple formula based on a pesticide's water solubility and the amount available on the soil surface. The runoff values are 0.01, 0.02, and 0.05 for water solubility <10 ppm, 10-100 ppm, and >100 ppm. This runoff exposure is characterized as "sheet runoff" (from one treated acre to an adjacent acre). Runoff exposure for semi-aquatic plants is determined using the same formula, except this runoff exposure is characterized as "channelized runoff" (from 10 treated acres to a distant low-lying acre).

Spray drift exposure from ground and aerial application (including airblast, forced-air, and chemigation applications) is 1 and 5%, respectively, of the application rate will drift off-site. EECs for terrestrial and semi-aquatic plants are provided in the Table below. See addendum for formulae used to calculate EECs.

Table 11: Estimated EECs for Terrestrial and Semi-aquatic Plants

Method and Rate of Application (lb ai/A)	Minimum Incorporation Depth (cm)	Runoff Value (%)	Sheet Run-off (lb ai/A)	Channel Run-off (lb ai/A)	Drift	Total Loading to Adjacent Area (Sheet Run-off+Drift)	Total Loading to Semi-aquatic Area (Channel Run-off+ Drift)
Unincorporated Ground							
5	-	0.05	0.25	2.50	0.05	0.30	2.55

The EC_{25} value of the most sensitive species in the seedling emergence study is compared to runoff and drift exposure to determine the RQ. The EC_{25} value of the most sensitive species in the vegetative vigor study is compared to the drift exposure to determine the RQ. Acute risk quotients are based on an emergence EC_{25} of >4 lb ai/A and a vegetative vigor EC_{25} of 0.05 lb ai/A.

Table 12: Acute Risk Quotients for Terrestrial and Semi-aquatic Plants

Unicorp. Ground Application	Emergence EC_{25} (lbs ai/A)	Vegetative Vigor EC_{25} (lbs ai/A)	Drift	Total Loading to Adjacent Area (Sheet Runoff+ Drift)	Total Loading to Semi-aquatic Area (Channel Run-off+ Drift)	Emergence RQ Terrestrial Plants	Emergence RQ Semi-Aquatic Plants	Vegetative Vigor RQ Terrestrial and Semi-Aquatic Plants
5.0	>4	0.05	0.01	0.3	2.55	0.08	0.64	0.00

Endangered species RQs based on a emergence EC_{05} of >4 lb ai/A and vegetative vigor EC_{05} of 0.018 ai/A is provided in the Table below.

Table 13: Endangered Species Risk Quotients for Terrestrial and Semi-aquatic Plants

Method and Rate of Application (lb ai/A)	Emergence EC_{05} (lbs ai/A)	Vegetative Vigor EC_{05} (lbs ai/A)	Drift	Total Loading to Adjacent Area (Sheet Runoff+ Drift)	Total Loading to Semi-aquatic Area (Channel Run-off+ Drift)	Emergence RQ Terrestrial Plants	Emergence RQ Semi-Aquatic Plants	Vegetative Vigor RQ Terrestrial and Semi-Aquatic Plants
Unincorp. Ground								
5.0	>4	0.018	0.01	0.3	2.55	0.08	0.64	0.00

The above results indicate that for terrestrial and semi-aquatic plants high acute (1) and endangered species (1) LOCs are not exceeded.

101.3 Endangered Species Concerns:

Endangered species triggers were not exceeded for any of the groups for which risk assessments were performed (terrestrial and aquatic animals, and terrestrial and semi-aquatic plants).

101.4 Adequacy of Toxicity Data:

Outstanding data requirements for this herbicide are avian reproduction (Gdln 71-4) and aquatic plant testing (Gdln 123-2).

101.5 Labeling Issues:

The following labeling modifications are suggested:

o the maximum annual use rate limitations should be listed in the beginning (or top) of the label, along with the other

pertinent use restrictions, e.g. do not apply by aircraft.

o with regard to spot applications, directions for use for all the sites should read similarly to that which was proposed for wheat (i.e. Do not apply more than 4 lb ai/A per year as a combination of broadcast sprays prior to crop emergence and as spot spray applications).

o directions for use on pome fruits are confusing (see pg 23) and should be modified to make clear that, although multiple applications are allowed, the maximum annual use rate is still 4 lb ai/A.

o directions for use on grasses are confusing and should clarify (if this is indeed the case) that the sites bahiagrass, bermudagrass, cool season grass covers and (Florida and Texas)/bermudagrass, guineagrass, paragrass and torpedograss all refer to perennial grass suppression in orchard floors.

102.0 Conclusions:

Even though acute, restricted-use and endangered species LOCs for avian and aquatic organisms; chronic risk LOCs for fish and aquatic invertebrates; and acute LOCs for terrestrial and semi-aquatic plants were not exceeded, the EEB cannot make a finding for "minimal risk" for this amended application at this time for the following reason. The product requires addition of a surfactant, and EEB has information suggesting this combination may result in greatly increased toxicity to aquatic organisms. See J. Felkel's 1/ 21/87 review for new chemical registration of end-use prodduct identified as SC-0224LC containing a sulfosate + surfactant combination. Results of formulated product fish testing showed formulation to be to 714X as toxic as the technical to aquatic organisms, exceeding special review and restricted-use triggers. Aquatic invertebrate and estuarine/marine toxicity testing was not performed on the formulation; neither was testing on the surfacatnt since registration was not pursued by the registrant. In the absence of ecotoxicity testing on sulfosate in combination with specific surfactants used with this product demonstrating low toxicity, the EEB cannot make a finding of "minimal risk" for this product use on pome fruits and wheat.

To better understand the role that surfactants play in the toxicity of this product, the following information is requested:

o the name of the surfactant that was contained in the unregistered SC-0224LC product, and whether or not its use is currently recommended for tank-mix with Touchdown Herbicide.

o a list of the recommended surfactants.

o any available ecotoxicity data utilizing surfactant/sulfosate combinations.

o the supplemental labeling for TOUCHDOWN Herbicide which was referenced on page 14 of the label.

Assessments for chronic risk to birds and acute risk to aquatic plants were not performed since data are lacking. Avian reproduction testing is required because multiple applications are allowed. Aquatic plant testing is required for five species; only one species was tested.

Reviewed by: Joanne Edwards, Entomologist
Ecological Effects Branch
Joanne L. Edwards 11/1/95

Approved by: Les Touart, Supervisory Biologist
Ecological Effects Branch
11-2-95

Approved by: Anthony F. Maciorowski, Chief
Ecological Effects Branch
Environmental Fate and Effects Division(7507C)
for H.T. Craven 11/8/95

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Addendum 1 -EEC Formulae

Calculating EECs for terrestrial plants inhabiting areas adjacent to treatment sites

Unincorporated ground application:

Runoff = maximum application rate (lbs ai/acre) x runoff value
Drift = maximum application rate x 0.01
Total Loading = runoff (lb ai/acre) + drift (lb ai/acre)

Incorporated ground application:

Runoff = [maximum application rate (lbs ai/acre) ÷ minimum incorporation depth (in.)] x runoff value
Drift = maximum application rate x 0.01
(Note: drift is not calculated if the product is incorporated at the time of application.)
Total Loading = runoff (lb ai/acre) + drift (lb ai/acre)

Aerial, airblast, forced-air, and chemigation applications:

Runoff = maximum application rate (lbs ai/acre) x 0.6 (60% application efficiency assumed) x runoff value
Drift = maximum application rate (lbs ai/acre) x 0.05
Total Loading = runoff (lb ai/acre) + drift (lb ai/acre)

Calculating EECs for semi-aquatic plants inhabiting wet, low-lying areas

Unincorporated ground application:

Runoff = maximum application rate (lbs ai/acre) x runoff value x 10 acres
Drift = maximum application rate x 0.01
Total Loading = runoff (lb ai/acre) + drift (lb ai/acre)

Incorporated ground application:

Runoff = [maximum application rate (lbs ai/acre)/minimum incorporation depth (in.)] x runoff value x 10 acres
Drift = maximum application rate x 0.01
(Note: drift is not calculated if the product is incorporated at the time of application.)
Total Loading = runoff (lb ai/acre) + drift (lb ai/acre)

[2] Non-target semi-aquatic plants are plants that usually inhabit low-lying wet areas that may or may not be dry in certain times of the year. These plants are not obligatory aquatic plants in that they do not live in a continuously aquatic environment.

Aerial, airblast, and forced-air applications:

Runoff = maximum application rate (lbs ai/acre) x 0.6 (60% application efficiency assumed) x runoff value x 10 acres
Drift = maximum application rate (lbs ai/acre) x 0.05
Total Loading = runoff (lb ai/acre) + drift (lb ai/acre)